

May 19, 1970

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3,512,635

WIRE LET-OFF ASSEMBLY WIRE COIL PACKAGE AND COMBINED WIRE  
COIL PACKAGE AND LET-OFF ASSEMBLY

Filed Oct. 31, 1968

2 Sheets-Sheet 1

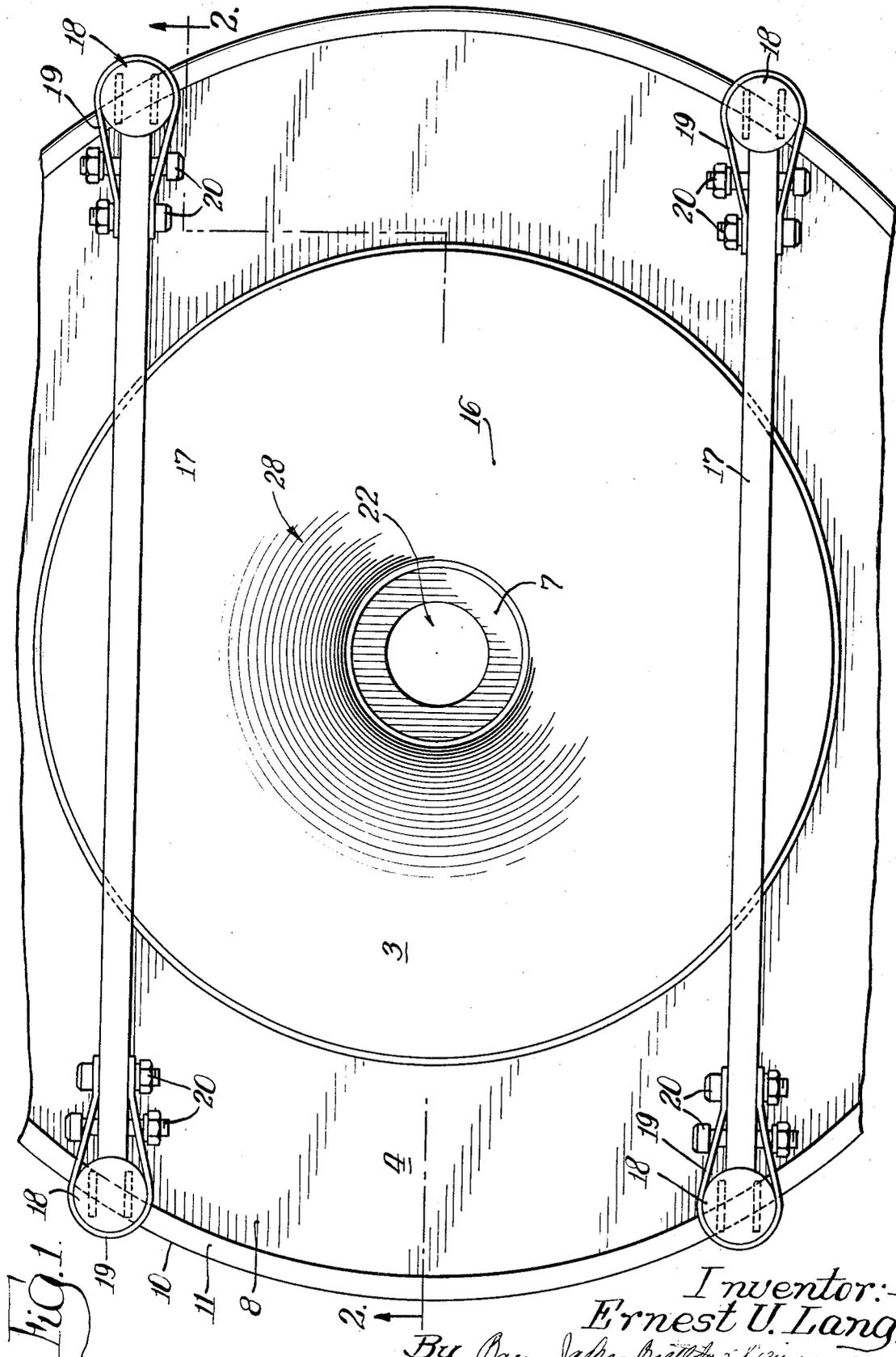


Fig. 1.

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**WIRE LET-OFF ASSEMBLY WIRE COIL PACKAGE AND COMBINED WIRE COIL PACKAGE AND LET-OFF ASSEMBLY**

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Filed Oct. 31, 1968, Ser. No. 772,276

Int. Cl. B65d 85/04

U.S. Cl. 206—52

12 Claims

**ABSTRACT OF THE DISCLOSURE**

A wire let-off assembly having a wire passageway for passing of wire from a coil of wire therethrough defined by an entry passageway of bell-shape configuration having a wire entry inlet at the end of large diameter and a wire entry outlet at the end of small diameter, an annular convex inner wall extending between the entry inlet and entry outlet of the entry passageway, and an exit passageway having a wire exit inlet and a wire exit outlet in axial alignment with the entry passageway. An assembly as last noted in which the exit passageway is of bell-shape configuration with the wire exit inlet at the end of small diameter and the wire exit outlet at the end of large diameter, arranged with the wire exit inlet in position to receive the wire from the wire entry outlet of the entry passageway, and in which an annular convex inner wall extends between the wire exit inlet and the wire outlet of the exit passageway.

A wire package in which a wire coil is formed by winding wire under tension less than the yield point of the wire on a mandrel with one twist per convolution and with a cast of greater diameter than the outside diameter of the coil.

The wire let-off assembly and wire coil as aforesaid in which the wire passageway of the let-off assembly is disposed in axial alignment with the axis of the wire coil with the wire entry inlet of the entry passageway at one end of the coil, and in which the inner convex wall of the entry passageway is of a radius permitting withdrawal of the wire from the coil through the entry passageway without affecting the cast of the wire. The wire let-off assembly and wire coil as last noted in which the annular convex inner wall of the exit passageway is of a radius permitting withdrawal of the wire from the exit passageway without affecting the cast of the wire.

**BACKGROUND OF THE INVENTION**

**Field of the invention**

The invention has to do with forming a wire coil package and a let-off device to provide for withdrawing of wire from the coil substantially tension free, torsion free and snag free, in which the wire in the winding thereof to form the coil or upon its withdrawal through the let-off device is not subject to stresses beyond the yield point of the wire, in which the cast of the wire is of a diameter greater than the outside diameter of the coil, and in which the cast of the wire is not affected upon withdrawal from the coil through the let-off device.

**Description of the prior art**

It is known in the prior art to wind wire under tension on a mandrel in the form of a helical coil with one twist per convolution with the theory being that upon withdrawal of the wire from the coil with the coil in stationary position the twist in the wire will neutralize the twist caused by axial withdrawal of the wire from the coil so that the wire will be delivered without torsional stress. Such known prior wire packages have not functioned in

their theoretical manner and upon axial withdrawal of the wire the wire snags with great frequency and are unsatisfactory. Resort has been made to the use of center posts in such packages in an unsuccessful attempt to prevent snarling, and further various complex schemes have been developed to attempt to prevent adjacent convolutions of withdrawn wire from forming a helix to thereby prevent snagging.

**SUMMARY OF THE INVENTION**

The present invention comprehends the provision of a novel wire coil package, a unique wire let-off assembly for withdrawing wire from the package, and the combined wire coil package and wire let-off assembly.

The wire coil package of the invention is characterized by winding of wire under tension on a mandrel without the wire being subjected to stresses beyond the yield point of the wire with one twist per convolution, and with a cast of greater diameter than the outside diameter of the wire coil.

Wire from a wire coil package as aforesaid may be withdrawn beginning at the inner diameter of the coil through a wire let-off device of the invention without subjecting the wire to stresses beyond the yield strength of the wire which permits the successive convolutions to form a free helix within the coil package so that the wire as it passes through the let-off device is substantially free of torsional forces and with minimum amount of tension for withdrawing of wire from the coil.

The wire let-off device is further characterized by the provision of passageway means for the wire from the coil of a construction permitting withdrawal of the wire from the coil without affecting the cast of the wire.

The wire coil package and wire let-off device of the present invention have particular utility for example in feeding torsion free wire to a fabricating device or for other purposes in which it is desirable that a predetermined cast in the wire is not affected by withdrawal of the wire from the wire coil package. This latter aspect is important for example in the fabricating of coil springs from a supply coil of wire in which it is desirable to maintain the cast of the wire in a given plane at the spring forming machine, and also in the art of welding where it is desirable that the wire pass through the welding gun with the cast in predetermined position in effecting a welding operation. The present invention achieves the last noted objectives by the provision of a novel wire coil package and a wire let-off device of simple construction.

The above and other advantages of the present invention will appear from the following detailed description of certain preferred embodiments of the invention.

**BRIEF DESCRIPTION OF THE DRAWING**

FIG. 1 is a plan view of the wire let-off assembly and wire coil package of the invention; and

FIG. 2 is a vertical sectional view taken substantially along the line 2—2 of FIG. 1 looking in the direction indicated by the arrows.

**DESCRIPTION OF PREFERRED EMBODIMENTS**

In the drawing there is shown at 3 the wire let-off device and at 4 the wire coil package of the invention in association with respect to each other for withdrawing wire from the coil through the let-off device. The wire coil package as best seen in FIG. 2 comprises a wire coil 5 in which wire has been laid in adjacent convolutions and in overlapping layers extending from the inside diameter to the outside diameter of the coil. The coil 5 may be formed for example by winding wire on a core mounted on a mandrel in the aforementioned adjacent convolutions and in successive overlapping layers. The wire as it

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is wound on the coil of the mandrel has one twist per convolution applied thereto and it is wound under tension less than the yield strength of the wire. The wire as wound on the core of the mandrel is of a predetermined free cast of a diameter greater than the outside of the outside diameter of the completed coil. In the winding of the wire on the core of the mandrel an end wall member as shown at 7 may be rigidly supported at one end of the core on the mandrel on which the wire is wound and a second end wall member as at 8 disposed at the opposite end of the coil. It will be noted that the annular end wall member 8 is formed with a central opening 9 of a diameter approximating the inside diameter of the coil of wire. Upon completing winding of the coil of wire on the core of the mandrel and between the end walls 7 and 8 a sheet metal wrapper 10, preferably of magnetic metal, is wound circumferentially around the outer periphery of the coil 5. Preferably the wrapper 10 is provided with radially inwardly extending flanges 11 which are folded radially inwardly over the outer surfaces of the end wall members 7 and 8. Thereafter, the assembled coil is removed from the mandrel and the inner core on the mandrel upon which the coil is wound is removed. There is thus provided a wire coil package comprising the coil 5, the end walls 7 and 8, and the peripheral wrapper 10 serving as a wire package ready for handling and shipment. For handling and shipping purposes a temporary or removable cover may be provided to close the opening 10 of the end wall member 8.

Formation of a coil of wire as last described provides a rigid strong package which will readily withstand rough handling. In a preferred embodiment of the invention, as for example, in coiling suitable wire for fabricating into coil springs or wire used for welding, the wire may have a cast in a range of about 40 inches to 60 inches and with the outside diameter of the coil being of about 22 inches. It will thus be observed that the cast of the wire is greater than the outside diameter of the coil.

The wire let-off device 3 comprises a substantially annular housing 14 formed of inner and outer cup-shaped members 15 and 16, made of sheet metal or other suitable light weight material and secured together with their open cavities in facing relation. A pair of parallel extending support bars 17 are secured to the outer cup-shaped member 16 and at their opposite ends have permanent magnets as at 18 secured thereto by strap clamps 19 secured to the support bars as by the nut and bolt assemblies indicated at 20.

The assembled cup-shaped members 15 and 16 are formed to provide a central wire passageway means as indicated at 22 for axial alignment with the axis of coil 5 when mounted thereon for withdrawal of wire from the coil as in the position of the parts shown in FIG. 2. The passageway means 22 comprises a wire entry passageway 23 formed in the inner cup-shaped member 15 and an exit wire passageway 24 formed in the outer cup-shaped member 16.

As best seen in FIG. 2, the entry passageway 23 of the cup-shaped member 15 is of substantially bell-shape configuration having a wire entry inlet at 25 at the end of large diameter and a wire entry outlet 26 at the end of small diameter. The exit passageway 24 of bell-shape configuration has a wire exit inlet 27 at the end of small diameter and a wire exit outlet 28 at the end of large diameter. The wire exit inlet 27 of the exit passageway 24 as shown is disposed in position to receive wire from the wire entry outlet 26 of the entry passageway 23. The wire entry passageway 23 is defined by an annular convex inner wall 30 extending between the entry inlet 25 and the entry outlet of the entry passageway 23. Similarly, a convex inner wall 32 extends between the wire exit inlet 27 and the wire exit outlet 28 of the exit passageway 24.

With the wire let-off device 3 assembled at the end of the wire coil package 4 at the opening 9 in the end

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wall member 8, wire from the coil may be withdrawn beginning at the inside diameter of the coil until completion of withdrawal of wire to the outside diameter of the coil through the wire passageway means 22.

The radius of the inner convex wall 30 provides for withdrawal of wire from the coil through the entry passageway 23 to enable passage of wire therethrough from the coil without affecting the predetermined cast of the wire of the coil. Similarly, the annular convex inner wall 32 is of a radius so that upon passing of wire therethrough the case of the withdrawn wire is not affected.

In the aforescribed wire passageway means 22 wire may be withdrawn from the coil 5 under slight tension substantially less than the yield strength of the wire and torsion free, and importantly without affecting the cast of the wire so that the wire may be utilized uniformly at a source for fabricating purposes or, for example, welding purposes.

In withdrawing of wire from the coil as above described, it has been discovered that the successive withdrawn convolutions of the wire form a helix which is free to move in the annular area 34 between the axially extended cylindrical wall 35 of the cup shaped member 15 and the inner periphery of the coil. This movement of the wire departs from prior art devices in that in the present invention the wire is permitted to freely form a helix and exhaust itself within the annular area 34 so that the wire when withdrawn through the let-off device is torsion free and is withdrawn without affecting the predetermined cast of the wire.

As aforesaid the wire when wound to form the coil 5 is wound under tension less than the yield strength of the wire, and the wire may be withdrawn under light tension substantially less than the yield strength of the wire. The wire coil package of the present invention thus provides withdrawing of the wire under light tension with the wire being torsion and snag free, and without the cast of the wire being affected by reason of the aforescribed construction of the wire passageway means of the let-off assembly 15.

It will be observed that upon mounting of the wire let-off assembly 15 at the open end of the coil of wire package that the let-off device in effect closes that end of the coil except for the wire passageway means of the let-off device. The let-off assembly 15 and end wall 8 are effective to prevent convolutions of wire from popping out through the opening 9 to enable the convolutions of wire to exhaust themselves of torsional stress permitting the torsion free withdrawal of the wire through the let-off device 15.

The large radius of the inner walls 30 and 32 of the entry passageway and the exit passageway defines smooth rounded curved surfaces so that the wire is not bent or kinked upon being withdrawn from the coil through the let-off device.

While there has been shown and described certain preferred embodiments of the invention, it will be understood that various modifications and rearrangements may be made therein without departing from the spirit and scope of the invention.

The invention claimed is:

1. A wire let-off assembly for utilization with a wire coil package having a magnetic metal component comprising a housing having wire passageway means extending therethrough adapted to be positioned at one end of the coil of wire with the axis of said passageway means in axial alignment with the axis of the coil of wire, said passageway means comprising an entry passageway of bell-shaped configuration having a wire entry inlet at the end of large diameter and a wire entry outlet at the end of the small diameter, an annular convex inner wall extending between the entry inlet and entry outlet of the entry passageway, an exit passageway having a wire exit inlet and a wire exit outlet in alignment with the entry passageway, and magnet means for magnetically engag-

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ing said magnetic metal component of said wire coil package to hold said let-off assembly in position on said wire coil package.

2. A wire coil package comprising a coil of wire having wire in adjacent convolutions and overlapping layers extending from the inside diameter to the outside diameter of the coil, said wire of said coil having one twist per convolution and being under tension less than the yield strength of the wire, and said convolutions having a cast of a diameter greater than the outside diameter of said coil.

3. The wire coil package of claim 2 in which said cast is in a range of about 40 inches to 60 inches and in which the outside diameter of said coil is about 22 inches.

4. The wire coil package of claim 2 having sheet magnetic metal wrapper extending circumferentially of the outer periphery of the coil.

5. The wire coil package of claim 4 having a first wall member substantially closing one end of the coil and a second end wall member at the other end of the coil having a central opening of a diameter approximately the inner diameter of said coil.

6. The wire coil package of claim 2 having a first end wall member substantially closing one end of the coil and a second end wall member at the other end of the coil having a central opening approximately the inner diameter of the coil, and an outer sheet magnetic metal wrapper extending circumferentially around the outer periphery of said coil having radially inwardly extending flanges engaging the outer peripheral edges of said first and second end wall members for holding the end wall members in engagement with the ends of the coil.

7. The combination of a wire let-off assembly and a coil of wire in which said wire let-off assembly comprises a housing having wire passageway means extending there-through adapted to be positioned at one end of said coil of wire with the axis of said passageway means in axial alignment with the axis of the coil of wire, said passageway means comprising an entry passageway of bell-shaped configuration having a wire entry inlet at the end of large diameter and a wire entry outlet at the end of small diameter, an annular convex inner wall extending between the entry inlet and entry outlet of the entry passageway, and an exit passageway having a wire exit inlet and a wire exit outlet in axial alignment with the entry passageway, said coil of wire comprising wire wound in adjacent convolutions in overlapping layers extending from the inside diameter to the outside diameter of the coil, said wire of said coil having one twist per convolution and being under

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tension less than the yield strength of the wire, said convolutions having a cast of a diameter greater than the outside diameter of said coil, and said inner convex wall of said entry passageway being of a radius permitting withdrawal of the wire from the coil through the entry passageway without affecting the cast of the wire.

8. The combination wire let-off assembly and coil of wire of claim 7 in which said exit passageway is of bell-shape configuration having a wire exit inlet at the end of small diameter and a wire exit outlet at the end of large diameter, arranged with the wire exit inlet in position to receive the wire from the wire entry outlet of the entry passageway, and in which an annular convex inner wall extends between the wire exit inlet and the wire exit outlet of the exit passageway of a radius permitting withdrawal of wire from the exit passageway without affecting the cast of the wire.

9. The combination wire let-off assembly and coil of wire of claim 7 in which the wire of said wire coil is under tension less than the yield strength of the wire, having one twist per convolution, and having a cast of a diameter greater than the outside diameter of the coil of wire.

10. The combination wire let-off assembly and coil of wire of claim 9 in which the wire coil is provided with a sheet metal magnetic wrapper extending circumferentially around the outer periphery of the coil, and magnetic means carried by said let-off device for magnetically engaging said magnetic metal of said wrapper to hold said let-off assembly in position on said wire coil.

11. The combination wire let-off assembly and coil of wire of claim 10 in which said wire coil has a first end wall member substantially closing one end of the coil and a second end wall member at the other end of the coil having a central opening of a diameter approximating the inner diameter of the coil.

12. The combined wire let-off assembly and coil of wire of claim 11 in which the wire of the wire coil has a cast in a range of about 40-60 inches, and in which the outside diameter of said coil is of about 22 inches.

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U.S. Cl. X.R.

206-59; 242-129